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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,627	07/05/2006	Josef Aspelmayr	S3-03P04867	1314

24131 7590 12/04/2008
LERNER GREENBERG STEMER LLP
P O BOX 2480
HOLLYWOOD, FL 33022-2480

EXAMINER	
MCCALISTER, WILLIAM M	
ART UNIT	PAPER NUMBER
3753	

MAIL DATE	DELIVERY MODE
12/04/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/567,627	ASPELMAYR ET AL.	
	Examiner	Art Unit	
	WILLIAM MCCALISTER	3753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 September 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 10-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schrod (DE 19 944 733, with US Patent 6,563,252 used as an English language equivalent thereof) in view of Takaku (US Patent 6,330,510).

With regard to claims 10-12, Schrod discloses a control method for a valve actuator, which comprises the following steps:

selectively charging the actuator to move the actuator from any one of a plurality of different open valve positions to any other one of the plurality of open valve positions without discharging the actuator to move the actuator into a closed position, each one of the plurality of open valve positions corresponding to a respective charge state (see FIG 2: between t1 and t2 different charge states of the actuator (Up) occur, which correspond to different partially open valve open positions),

controlling the charging according to a specified control action (the charging signal shown at S1 in FIG 2, and described at col. 4 line 63 to col. 5 line 17) corresponding to a specified setpoint value for the charge state (see col. 5 lines 4-10, and 40-57);

during an idle time (between t2 and t3, as shown in FIG 2) between two consecutive chargings (the sequence shown in FIG 2 is repeatedly executed), determining a controlled variable by measuring a voltage across the actuator which reflects the charge state of the actuator (column 5 lines 50-57 describe measuring the “actuator voltage”); and

during the idle time between the two consecutive chargings, regulating the control action (the charging signal shown at S1 in FIG 2) in dependence on the controlled variable (see column 5 lines 50-57, regulation of the charging signal occurs to recharge the actuator voltage during the hold phase, and is based on the measured actuator voltage).

Schrod does not disclose acquiring an external measured variable in the form of a pressure at the valve; or regulating the control action in dependence on the external measured variable during the idle time. However, Takaku teaches that it was known in the art at the time of invention to measure pressure at an injection valve (see pressure sensor 12) to electronically control actuation of the injection valve (see column 5 line 66 – column 6 line 17) based on pressure at the injection valve. To account for pressure at the injection valve in Schrod's determination of injection opening duration, it would have been obvious to one of ordinary skill in the art at the time of invention to supplement Schrod's method with Takaku's pressure measuring and injection time determination steps, and to incorporate the results thereof into Schrod's regulating step.

With regard to claims 13 Schrod discloses the step of determining the control action for charging by a specified charging characteristic (see description of "possible forms and durations of the charging curve" at column 6, lines 17-29, which are determined by the charging signal shown at S1 in FIG 2), determining the control action for discharging by a specified discharging characteristic (see description of "possible forms and durations

of the … discharge curve" at column 6, lines 17-29), wherein the charging characteristic and the discharging characteristic have a specified shape and steepness (all represented curves have a specified shape and steepness).

With regard to claims 14 and 15, Schrod discloses the control method to comprise the step of adjusting the steepness and shape of the charging characteristic as part of the regulating step. (See column 6 lines 17-21: "different forms … of the charging curve … can now be represented … as a function of … variations of the energy storage capacitor voltage". Note that different shape implies a different steepness, and that a different form implies a different shape).

With regard to claim 16, Schrod discloses the control method to further comprise determining the control action by the charging duration (see description of "possible forms and durations of the charging curve" at column 6, lines 17-29), wherein the charging duration is adjusted as part of the regulating step (see reference to "variations of the energy storage capacitor voltage", at column 6 lines 17-21).

With regard to claim 17, Schrod discloses that it was known in the art at the time of invention that piezoelectric actuators are a well-known type of capacitive actuator usable with control systems such as that disclosed by Schrod (see Background of the Invention). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use a piezoelectric actuator with Schrod's method of control.

Schrod also discloses the injection valve to be an injection valve for an internal combustion engine (see column 1 lines 13-15).

With regard to claim 18, Schrod discloses the regulating step to be a closed-loop control step (the results of the recharging step are necessarily incorporated into the next iteration of an actuator voltage measurement during a hold phase).

With regard to claim 19, Schrod discloses a control device for at least one valve actuator, the control device comprising:

a controller (generally FIG 3) for controlled charging and/or discharging of the actuator to move the actuator from any one of a plurality of different open valve positions to any other one of the plurality of open valve positions without discharging the actuator to move the actuator into a closed position, each one of the plurality of open valve positions corresponding to a respective charge state (see FIG 2: between t1 and t2 different charge states of the actuator (Up) occur, which correspond to different partially open valve open positions), said controller being characterized by a specified control action (the charging signal shown at S1 in FIG 2, and described at col. 4 line 63 to col. 5 line 17); and

a closed-loop (the results of the recharging step are necessarily incorporated into the next iteration of an actuator voltage measurement during a hold phase) control regulator (structure which implements the output of the comparison function described

at col. 5 lines 50-57) connected to said controller for adapting the control action of said controller;

said regulator having an input connected to the actuator and/or to the valve in order to acquire a first controlled variable (inherent as the regulator obtains the actuator voltage, as set forth in the analysis of claim 10);

the controlled variable reflecting a charge state of the actuator and/or a valve position (see description of “actuator voltage” at column 5 lines 50-54); and

said regulator being configured to acquire the controlled variable discontinuously during idle times in each case and adjusting the control action discontinuously in idle times in each case (see description of operation during "hold phases" at column 5 lines 50-57, which are separated by charging and discharging steps, see FIG 2);

Schrod does not disclose the regulator to have an input connected to at least one sensor for detecting a pressure at the valve defining a second controlled variable. However, Takaku teaches that it was known in the art at the time of invention to use a pressure sensor at an injection valve (see pressure sensor 12) to measure and electronically control actuation of the injection valve (see column 5 line 66 – column 6 line 17) based on pressure at the injection valve. To account for pressure at the injection valve in Schrod’s determination of injection opening duration, it would have

been obvious to one of ordinary skill in the art at the time of invention to supplement Schrod's regulator with Takaku's pressure sensor and associated CPU functions.

With regard to claim 20, Schrod and Takaku disclose the invention as claimed, but not the position of the regulator. However, at the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to superimpose the regulator onto the controller because applicant has not disclosed that this position provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with Shrod because the position of the regulator does not affect its function.

With regard to claim 21, Schrod discloses that it was known in the art at the time of invention that piezoelectric actuators are a well-known type of capacitive actuator usable with control systems such as that disclosed (see Background of the Invention). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use a piezoelectric actuator with Schrod's method of control. Schrod also discloses the injection valve to be an injection valve for an internal combustion engine (see column 1 lines 13-15).

5. Claim 10-21 are alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Schrod and Takaku as applied above, and further in view of Shinogle (US Patent Application Publication 2001/0035465).

Regarding claims 10, 11 and 19, Schrod and Takaku substantially disclose the invention as claimed (see the analyses set forth above). Should it be determined that Schrod lacks an implicit disclosure of the actuator charge state corresponding to different valve open positions, Shinogle teaches that, in order to produce different rate shapes and thereby control exhaust emissions, it was known to correlate the charge of piezoelectric actuators to partially open valve positions (see paragraphs 16 and 19). To control exhaust emissions with Schrod's device, it therefore would have been obvious to one of ordinary skill in the art at the time of invention to correlate the charge of Schrod's piezoelectric actuator to partially open injector valve positions.

Regarding claims 12-18, 20 and 21, see the analyses set forth above.

Response to Arguments

1. Applicant's arguments filed 9/4/2008 have been fully considered but they are not persuasive.

2. Applicant argues that Schrod and Shinogle fail to disclose the step of charging the actuator voltage such that the valve is controlled from one open position to another open position without an intermediate closed state (Remarks, pp. 9-11). Applicant

notes that the different charge states (the pilot and main injection events) illustrated by FIG 2 of Shinogle are interrupted by a closed state. In response, the claim language reads on the single, main injection state of FIG 2. As Schrod's actuator voltage increases during time t1 to t2, the injector valve transitions through different positions. Although it seems that Applicant's disclosure differs from the prior art, Applicant's claim language is yet to reflect this difference.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM MCCALISTER whose telephone number is (571)270-1869. The examiner can normally be reached on Monday through Friday, 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Huson can be reached on 571-272-4887. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/WILLIAM MCCALISTER/
Examiner, Art Unit 3753

/John Rivell/
Primary Examiner, Art Unit 3753

WM
11/25/2008